

Missouri 911 Modernization and Improvement Report



**December 31, 2017
A Report of the Missouri Department of Public Safety
And the Missouri 911 Service Board**

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1. INTRODUCTION

Revised Statutes of Missouri 190.450 required the Department of Public Safety (DPS) to complete a study and issue a plan for provision of best 911 technology and services statewide. The purpose of this report is to respond to specific requirements included in this statute:

RSMO 190.450. Department to complete study, issue plan for provision of best 911 technology and services statewide. - By December 31, 2017, the department of public safety shall complete a study of the number of public safety answering points necessary to provide the best possible 911 technology and service to all areas of the state in the most efficient and economical manner possible, issue a state public safety answering point consolidation plan based on the study, and provide such plan to the Missouri 911 service board.

The Department of Public Safety working with the Missouri 911 Service Board, employed a variety of strategies to inform the content and recommendations of this report, including:

- **Expert Consultation:** DPS consulted with Missouri 911 experts with extensive knowledge of Missouri's 911 system. This included consultation with members of the Missouri 911 Service Board. Together the experts worked as a team on the report.
- **PSAP Survey:** DPS conducted a survey of all known PSAPs in the state and analyzed survey responses, using the expertise of 911 Service Board members and other Missouri 911 experts to select survey questions.
- **Literature Review:** The Missouri 911 experts conducted extensive research on 911 trends on the local and national level. This included a review of existing Missouri PSAP studies and other state PSAP studies. Research also included review of literature published by nationally recognized 911 organizations, such as the National Emergency Number Association (NENA) and the Association of Public Safety Communications Officials (APCO)

1.1 EXECUTIVE SUMMARY

In response to statutory requirements, the Department of Public Safety presents this report as a comprehensive overview of the Missouri 911 system. This report also provides recommendations on how to provide the best possible 911 technology and service to all areas of the state in the most efficient and economical manner possible. The current status of Missouri's 911 system and opportunities for improved services were informed through data collection, academic literature, and expert consultation.

The reported status of Missouri's current 911 system was consistent with expectant findings. Although successful implementation of 911 may exist at local, or in rare cases regional levels, Missouri has a disjointed and inefficient system statewide. DPS identified the following areas as current challenges for the Missouri 911 system that inhibit opportunities for improved services, technologies and efficiencies:

- **Lack of Statewide 911 Coordination and Interoperability:** Lack of statewide 911 coordination and a statewide 911 network leaves Missouri with a fragmented 911 system. The system is pieced together by approximately 185 independent PSAPs, each operating under a different county system.
- **Discrepancies in Service Level Capabilities:** In Missouri, emergency response services can vary greatly based on where the call is made in the state. A majority of counties provide Phase II level service, with the ability for PSAPs to locate callers calling from cell phones. 16 counties only offer the lowest level of 911 service permissible under federal law, with calls being delivered on seven-digit lines with no caller information. In addition, 16 counties can receive text-to-911, the highest level of 911 service currently available Missouri.
- **Inability to Locate 911 Callers:** 28 of Missouri counties lack the ability to locate callers who call from cell phones, leaving Missouri behind the rest of the nation in terms of service level available statewide. Nationwide, 98.8 percent of the population can be located when calling 911.¹
- **Minimal Emergency Medical Dispatch Services:** Over half of Missouri PSAPs cannot provide lifesaving Emergency Medical Dispatch (EMD) services. EMD uses pre-arrival and post-dispatch instructions to help callers respond to medical emergencies until first responders arrive at the scene.
- **Antiquated and Incompatible 911 Infrastructure:** While many states are looking toward Next Generation 911-equipped IP Networks, many Missouri PSAPs rely on antiquated technology that is rapidly becoming unsustainable. A great variance in equipment and technology among Missouri PSAPs impedes the interoperability necessary to transfer 911 calls to another PSAP.
- **Understaffed PSAPs:** Over half of Missouri PSAPs are understaffed according to industry standards, leaving a number of Missouri PSAPs without the capacity to handle an influx in call volume or provide adequate 24-hour, seven-day-a-week 911 services.
- **Insufficient and Inconsistent Funding Mechanisms:** Missouri does not have state funding for 911, leaving counties with three options for funding, including: a landline surcharge, a county level sales tax, or local funding. Despite over 70 percent of 911 calls being made from cell phones, Missouri remains the only state in the nation without 911 funding from wireless devices.

The report team believes there are cost-effective opportunities to improve statewide 911 services and efficiencies. This report offers a variety of recommendations, including:

- Development of a Statewide 911 Network
- Regional 911 Coordination
- Consolidation of Existing PSAPs
- Recommendations for Additional Funding
- Recommendations for Additional Change in Statute

¹ National Emergency Number Association. "9-1-1 Statistics." December 2017. <https://www.nena.org/?page=911Statistics>

1.2 PSAP SURVEY SUMMARY

In order to report an overview of the state of 911 in Missouri, the Department of Public Safety disseminated a survey to the 185 known PSAPs in the state. Because of the high PSAP response rate to the survey, this is the most comprehensive study conducted on the state of Missouri PSAPs to date. For example, the last report of Missouri PSAPs was conducted in 2013 using survey data from only 24.7 percent of PSAPs². Of the 185 PSAPs surveyed for this report, DPS received 139 completed surveys, accounting for 75 percent of PSAPs in the state.

Survey results were used by DPS to develop a report on the status of 911 in Missouri and to develop a comprehensive set of recommendations to improve services in the state. Survey questions were developed by DPS with assistance from the 911 Service Board. The survey requested a variety of information about the PSAP, including: name and type of PSAP, service area, call volume, dispatch services, personnel, budget, equipment and technology, and past or future considerations for consolidation. Surveys were sent via email using combined email lists from DPS and the Missouri 911 Director's Association. The first survey request was emailed to PSAPs on October 3, 2017, with additional emails and follow-up from DPS and the 911 Service Board through a November 20, 2017 deadline. Although DPS will continue collecting responses until reaching 100 percent PSAP response, data in this report was collected from responses received by November 20, 2017. DPS and members of the 911 Service Board screened response data for reliability and validity. Any discrepancies from expected results and actual responses were verified or corrected by the reporting PSAP.

Not only were there a significant number of individual responses, they included a diverse representation of Missouri PSAPs. Based on the percentage of the PSAPs responding to the survey and proportionate representation of diverse PSAPs, findings are determined to be statistically accurate with a small margin for error. Survey responses included representation from the categories:

- Primary and secondary PSAPs
- All service levels ranging from basic 911 (lowest service level) to text-to-911 (highest service level offered in Missouri)
- 84 counties from all classifications including: 29 PSAPs in charter counties, 33 PSAPs in Class 1 counties; 2 PSAPs in Class 2 counties; 71 PSAPs in Class 3 counties; and 4 PSAPs in Class 4 counties

Although there was a significant response rate, initial lack of data for individual PSAPs account for shortcomings. Without data reporting requirements for PSAPs, DPS and the 911 Service Board lacked a complete and accurate list of current PSAPs with up-to-date contact information. Throughout the survey distribution and collection process, DPS was able to modify and update a list of state PSAPs in which 185 total PSAPs were identified by December 31, 2017.

² "Missouri 911 Improvement Study," Stone Carlie, January 31, 2013

2. OVERVIEW OF MISSOURI 911 SYSTEM

Lack of statewide 911 coordination and a statewide 911 network leaves Missouri with a fragmented 911 system. The system is pieced together by approximately 185 independent PSAPs, each operating under a different county system. Most Missourians do not know that the likelihood their 911 call will be answered, and the emergency response services they receive, vary greatly depending on their location when the call is made. Each PSAP has a designated service area population. Often a PSAP provides services for an entire county, although some counties have no PSAP or multiple PSAPs with designated service area populations. PSAPs rely on local funding collected through a county 911-funding mechanism or local revenue sources. Consequently, there is a significant variance in the quality of 911 and emergency response a PSAP is capable of providing.

2.1 PSAP FUNCTION AND OPERATIONS

Accepted industry standard defines a **Public Safety Answering Point (PSAP)** as “an entity responsible for receiving 911 calls and processing those calls according to a specific operational policy.”³ All PSAPs perform the primary function of **call-taking** and **response** (either dispatch or transfer). Operational policies are determined by the type of PSAP:

- **Primary PSAPs** are PSAPs to which 911 calls are routed directly from the 911 control office. This includes the majority of Missouri PSAPs, and account for 124 survey responses.
- **Secondary PSAPs** are PSAPs to which 911 calls are transferred from a primary PSAP. Secondary PSAPs make up a much smaller number in the state and account for 15 survey responses.

When an emergency call is received at a **primary PSAP**, it is answered by a **telecommunicator**, or person employed by the PSAP qualified and trained to answer and appropriately respond to an emergency. Once a call is answered and caller and situational information is gathered, a telecommunicator may perform **direct dispatch**, or dispatching of emergency personnel directly from the primary PSAP. If the primary PSAP does not perform direct dispatch, or needs dispatch services the PSAP does not provide, the telecommunicator will alternatively transfer the call to a **secondary PSAP** or another agency for dispatch.⁴

Of the 124 primary PSAPs that responded to the survey, 100 percent dispatch for at least one law enforcement, fire, or emergency medical services (EMS) agency; but only 94 of the primary PSAPs (76 percent) perform dispatch services for all three types of agencies. This means that the remaining 30

³ National Emergency Number Association definition of “Public Safety Answering Point,” (Master Glossary of 9-1-1 Terminology, August 8, 2017)

⁴ The most significant example of 911 call routing to non-PSAP locations is the 9 Missouri State Highway Patrol Communications Centers. While MSHP troops can play a vital role in handling 911 calls, they do not fit under the FCC definition of a PSAP, and therefore were not included as PSAPs for the purposes of this report.

primary PSAPs (24 percent) transfer those calls to a secondary PSAP or other agency for some dispatch services. Most typically this is a transfer for EMS dispatch.

2.2 CALL VOLUME

Incoming call volume is a key component in understanding an individual PSAP and trends for the state as a whole. Of the 139 PSAPs that responded to the survey, 121 PSAPs (87 percent) were able to track and report their incoming calls. They reported an annual total of 8,246,012 incoming calls, with individual PSAP call volumes ranging from 217 calls per year to 1,202,589 per year. Incoming call volume included the total for all incoming 911 calls. Most PSAPs also included incoming administrative calls. The survey requested that administrative calls be counted in a PSAP's call volume because they require time from telecommunicators for answering and responding. Of the remaining 13 percent of PSAPs not reporting call volume, it was indicated and expected that these PSAPs did not have the technological capability to track calls. Although not significant to the outcomes of this report, the inability to track calls is concerning for an individual PSAP, because incoming call volume is important to determine the operating needs of a PSAP in terms of staff and equipment needed.

The survey also included questions about incoming calls based on device technology: landline, wireless, VoIP (voice over Internet Protocol), and text message (if applicable). Of the 121 PSAPs with the ability to track incoming calls, 79 were able to report incoming call volume based on the type of device used to make the call. The reported trend closely reflects the national trend in call volume by type. Reporting PSAPs received an average of 25 percent of calls from landline devices, which is only slightly above the national average.⁵ Seventy-two percent of calls were received from wireless devices, which is only slightly lower than the national average.⁶ Data comparison to Missouri's 2013 study confirms an ever-increasing number of calls received from wireless devices, and correlating decrease in calls received from landline devices.⁷

By the end of 2016, more than half of American households had only wireless phones compared to 10 percent in 2004.⁸ Although Missouri is slightly above the national average for calls made to 911 from landline devices, this minor discrepancy can be explained with two considerations. First, the population of adults aged 65 and over accounts for the highest demographic with landlines in their homes. Seventy-six percent of adults aged 65 and over have landlines in their homes, compared to only 28-38 percent of adults aged 18-44 years old.⁹ Rural populations also account for a higher-than-average use of landlines over cell phones. Consideration for Missouri's aging population, as well as rural population, may

⁵ National average for consumers using cellular phones to make 911 calls is 76 percent (National 911 Program, 2016)

⁶ National average for consumers using wireline phones to make 911 calls is 21 percent. (National 911 Program, 2016)

⁷ In 2013, Missouri PSAPs reported receiving approximately 29 percent of calls from landlines (a 4 percent decrease in 2017) and 69 percent of calls from wireless devices (a 2 percent increase in 2017).

⁸ National Center for Health Statistics, 2017

⁹ National Center for Health Statistics, 2017

contribute for the higher-than-average number of calls from landline devices. Additionally, a greater number of administrative calls, included in call volume for many PSAPs, are made using landlines.

3. OVERVIEW OF CURRENT 911 SERVICES IN MISSOURI

There are significant discrepancies in the level of emergency response services an individual PSAP is capable of providing to its service area population. Under federal law, 911 calls are required to be routed to a phone number, but the process by which calls are answered and responded to is determined by the service level the PSAP is capable of providing. In counties with multiple PSAPs, residents may receive different levels of service based on the PSAP receiving the 911 call. Two key components affecting emergency response services include the call information received at the PSAP and a PSAP's ability to provide or connect a caller to Emergency Medical Dispatch services.

3.1 SERVICE LEVELS DEFINED BY CALLER INFORMATION RECEIVED

The following are the service levels available for processing 911 calls:

- **Basic 911: 16 counties provide Basic 911 service.** Counties with Basic 911 services do not have 911 answering equipment, and may not have PSAPs or telecommunicators. Calls are delivered on seven-digit lines. The call-taker does not receive the caller's name or location.
- **Wireline E-911: 11 counties provide Wireline E-911 service.** In counties with Wireline E-911 level service, a PSAP receives the subscriber name and location of caller on a landline phone. These PSAPs are not able to locate callers on wireless devices.
- **Phase I: 1 county provides phase I service.** In counties with Phase I level service, a PSAP receives the caller's phone number, and cell tower and sector address in which the call was made. The PSAP cannot locate the caller's exact location from wireless devices.
- **Phase II: 70 counties provide Phase II level service.** In counties with Phase II level service, a PSAP receives the caller's phone number, cell tower address and sector the call came from and latitude/longitude information of a caller on a wireless device.
- **Phase IIT (Text-to-911): 16 counties provide Phase IIT level service.** In counties with Phase II level service, a PSAP receives the caller's phone number, cell tower address and sector in which the call was made, as well as latitude/longitude information for a caller on a wireless device. PSAP can determine the caller's exact location from wireless devices.
- **Next Generation 911 (NG911): No Missouri counties have Next Generation 911.** With NG911, PSAPs could receive digital information through data, including voice, text, photos and videos. Although there are Missouri PSAPs equipped with NG911-capable equipment, no known PSAP operates on a NG911 IP Network.

3.2 IMPLICATIONS FOR COUNTIES WITH LESS THAN PHASE II LEVEL SERVICE

In Missouri, 28 counties lack the ability to locate callers coming from cell phones. Phase II level service, marked by ability for PSAPs to locate callers calling from cell phones, is a minimum service level standard expected by the 911 industry and general population. Ninety-seven point one percent of counties in the United States, and 98.8 percent of the population have at least Phase II level service.¹⁰ This leaves Missouri in the handful of states that do not provide this level of service statewide. While residents of these 28 Missouri counties may be disproportionately impacted by inadequate service, it becomes a statewide issue with consideration for Missouri travelers. For example, according to the National Park Service, 1.2 million St. Louis County residents travel to South Central Missouri, travelling from the Phase II service level they are used to receiving, to an area predominately receiving only basic level 911.

Sixteen Missouri counties offer only Basic 911, the lowest 911 service level permissible under federal law. These calls are delivered on seven-digit lines and when calls are answered, the caller must provide their name, callback number, and location. Of these 16 counties, 10 have a PSAP and 6 do not. In counties without a PSAP, calls are routed to a designation determined by the county. This may be a PSAP in a nearby county, police station, sheriff's office, or in some cases another government entity such as city hall. Calls are not necessarily answered by a telecommunicator trained to receive or respond to 911 calls. In cases where basic 911 counties do have PSAPs, a trained telecommunicator may be answering the calls, but still lack the equipment necessary to receive any information about the caller.

In addition to caller information received, Emergency Medical Dispatch (EMD) is another key component in determining a PSAP's quality of emergency response service.

3.3 EMERGENCY MEDICAL DISPATCH

Emergency Medical Dispatch (EMD) uses certified telecommunicators and dispatchers to provide medical emergency treatment instructions to callers over the phone. EMD has been a best practice in the emergency services realm since the early 1990s, with well-established training and certification programs. Telecommunicators use formal techniques to gather information from the calling party about the nature of a medical emergency, and then use a sequence of steps to provide appropriate treatment instructions over the phone.

Properly functioning EMD has been proven to be a life-saving service, providing bystanders with instructions to respond to medical emergency in time-critical situations before emergency personnel arrive. Examples include instructions on performing the Heimlich maneuver, bleeding control, and child birth. For example, when a citizen goes into cardiac arrest, there are two key factors affecting their survival: early CPR and defibrillation. In this situation, EMD would assist bystanders with the initiation of CPR and help them locate automated external defibrillators (AEDs).

¹⁰ National Emergency Number Association. "9-1-1 Statistics." December 2017, <https://www.nena.org/?page=911Statistics>

The impact of EMD has been studied extensively and has a measurable impact. Not only does EMD allow callers to provide temporary medical treatment, but it also allows first responders the situational awareness necessary to act quickly once they arrive at the scene. Early notification also allows first responders to alert other entities needed for medical assistance, such as helicopters or an emergency room that might be receiving a patient.

The status of EMD in Missouri is abysmal. According to survey data, 52 percent of PSAPs do not provide EMD. A survey of ambulance services conducted four years ago showed 40 to 50 percent were dispatched by PSAPs that did not provide EMD. To compound that finding, some of the PSAPs that offer EMD do so with inadequate training and little medical oversight. Thus, a PSAP may claim to provide the service but in effect they do not.

While parts of Missouri still struggle to provide base-level service, the nation as a whole is looking toward implementation of NG911. In its current form, Missouri's inability to improve service levels is ultimately determined by barriers in technology and funding, which will be discussed in the following sections.

4. OVERVIEW OF CURRENT 911 INFRASTRUCTURE IN MISSOURI

Missouri has a fragmented 911 system, distinguished by great variance in equipment and corresponding disparate service levels. Although technology used by 911 callers has advanced greatly, technology used to answer and process those calls has failed to keep pace. Missouri PSAPs are still having calls delivered by technology and circuits that were developed in the 1960s. At this time, 16 counties in Missouri do not have the 911 answering equipment needed to deliver more than basic 911 services. Much of Missouri's 911 system relies on 911 technology that is rapidly becoming obsolete, while simultaneously seeing diminishing funding needed to improve service. There is a consensus in the 911 industry that significant changes will need to be made to handle increased 911 traffic and respond to new technologies, such as allowing wireless users to communicate with PSAPs by sending texts, pictures, and videos.

Missouri's recent decision to opt-in to the nationwide First Responder Network Authority (FirstNet) is intended to improve communication between PSAPs and first responders by providing high-speed data communication services. Once implemented, first responders will have the ability to communicate with each other through broadband technology and send photos, videos, and other forms of digital media.

Although this may provide vital improvements among responders, communication between callers and telecommunicators will remain the weakest link in emergency communication. Without the ability to receive information at a PSAP, first responders will be limited in their ability to use FirstNet to its fullest capacity.

Key components of 911 infrastructure include equipment and personnel, which are described in the next two sections.

4.1 911 CALL-TAKING AND DISPATCHING EQUIPMENT

At a minimum, PSAPs need infrastructure to appropriately take 911 calls and respond to them. Although all of the primary PSAPs responding to the survey provide some kind of dispatching service, it is important to recognize that 911 call-taking and emergency response dispatching are two separate services. Therefore the equipment needed for each will be described separately.

Equipment needed to provide Phase II level 911 **call-taking** include:

- **911 Trunks:** Typically, communication paths between central office switches or between the 911 Control Office and the PSAP.¹¹
- **Physical Work Station with Call Answering Equipment:** Every PSAP has a minimum of one 911 workstation to answer 911 calls. Basic call answering equipment, at a minimum, includes a computer with connections to a 911 router and with 911 software that allow PSAPs to receive caller information.
- **Master Street Address Guide (MSAG):** In order to locate callers, PSAPs need emergency service addressing. Typically, this information is stored in an MSAG, or a database of street names and house number ranges within their service area. This helps define Emergency Service Zones and associated Emergency Service Numbers to enable proper routing and dispatching of 911 calls.

Additional equipment needed to provide 911 **dispatch** include:

- **Computer Aided Dispatch (CAD):** In order to dispatch calls, a telecommunicator relies on Computer Aided Dispatch (CAD), a computer-based system that aids PSAP telecommunicators by automating selected dispatching and record-keeping activities.
- **Radio System:** Additionally, PSAPs typically need a radio system and software to communicate with first responders.

At the core of a call center's infrastructure is its 911 trunk. PSAPs contract with a service provider to provide a communication path between 911 switchboards and the PSAP. A 911 workstation is composed of the equipment needed to utilize that connection and answer 911 calls. A workstation also includes the personnel needed to answer and process 911 calls. The 139 PSAPs responding to the survey had a total of 567 physical workstations.

The cost of trunk connections is significant, and based on survey results, a majority of Missouri PSAPs contract with either AT&T or CenturyLink to provide connections. By using different service providers,

¹¹ National Emergency Number Association. "Master Glossary of 9-1-1 Terminology." August 8, 2017.
http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-ADM-000.21-2017_Final_2.pdf

PSAPs lack the potential for interoperability. The ability for two counties to transfer 911 calls is greatly limited if those two counties use different primary 911 telephone companies. There may be no connection for the 911 call data to cross company lines. When transferring is possible, the cost charged by the telephone companies may be prohibitive.

The costs for equipment necessary to establish a physical workstation vary. Before accounting for personnel, a workstation can be as low as \$23,000 if it only includes call-taking equipment, but costs can be as high as \$150,000 per workstation if it includes high quality dispatching services.

Typically, physical workstations for PSAPs providing Phase II level are over \$100,000, with at least \$23,000 needed for 911 answering equipment and approximately \$95,000 for radio and CAD system software. Costs for maintaining these positions remains high, with most hardware generally needing replacement every five years to keep up with changes in technology.

Missouri's reported 567 physical workstations are each equipped with a wide variation of hardware and software. Of the reporting PSAPs, there were 37 different types of CAD systems used. Only two CAD systems account for majorities. Forty-one PSAPs use ITI CAD Systems and 22 PSAPs use Caliber Public Safety/Global Solutions. Five PSAPs reported using two different CAD systems, either because they are currently transitioning to a new system, or because they use different CAD systems for different types of dispatch.

There was less variance among radio systems, with responding PSAPs using one of 15 system types, but with a majority using either Motorola (67 PSAPs) or Zetron (34 PSAPs).

The variance in 911 infrastructure signals the lack of interoperability among Missouri PSAPs and first responders. This provides significant barriers when trying to improve service levels, with PSAPs lacking the technological capabilities necessary to communicate with one another.

4.2 PERSONNEL

The largest costs related to providing of 911 services are for staff and training. In order for a workstation to be considered fully staffed, typically six full-time telecommunicators are required. This accounts for 24-hour, seven-day-a-week coverage, with a telecommunicator always seated at the workstation prepared to take calls. Six full-time telecommunicators ensure each telecommunicator has standard-length shifts, relief, vacation and paid time off.

Based on this standard, reporting PSAPs would need 3,402 full-time call takers to fully staff the 567 PSAPs. Budgeted, authorized telecommunicator positions for reporting PSAPs only include 1,763 full-time positions and 327 part-time positions, with 60 percent of PSAPs understaffed based only on their budgeted, authorized positions. An even greater number of PSAPs would be considered understaffed based on the standard of six full-time positions needed to fully staff a workstation. Although some large PSAPs have workstations intended to remain unstaffed unless experiencing an exceptionally high volume of calls, it remains that many of Missouri's PSAPs may be underutilized.

In addition to understaffing, almost 80 percent of all telecommunicators perform non-911 duties, including: clerical duties, answering other phone lines, entering warrants, and monitoring prisoners. In small PSAPs with a low call volume, additional duties may be justified and necessary based on overall staffing capacity. It can become a concern when the only telecommunicator on duty is preoccupied with other responsibilities. While performing other duties, there is a risk that 911 calls could go unanswered, especially without the infrastructure necessary to reroute those calls to another PSAP.

5. OVERVIEW OF CURRENT 911 FUNDING IN MISSOURI

Without state funding for 911, counties are left with three options to fund local 911. Despite over 70 percent of 911 calls being made from cell phones, Missouri remains the only state in the nation with no 911 funding from wireless devices. Failure to update an antiquated statute that currently limits the definition of ‘telephone’ to only include wireline phones leaves counties with decreasing and insufficient funding.

The following are funding options authorized by Missouri state statute:

- **Wireline Surcharge (Landline Surcharge) (RSMo 190.305): 43 Counties Fund 911 with a Wireline Surcharge.** An authorized wireline surcharge is applied against the basic service from a wireline carrier, capped at 15 percent of the basic service level amount.
- **County-Level Sales Tax (RSMo 190.335): 52 Counties Fund 911 with a County-Level Sales Tax.** Upon voter approval, counties may implement a sales tax additive of up to one percent for funding 911.
- **No Funding Mechanism: 19 Counties Have No Local Funding Mechanism For 911.** Without use of a wireline surcharge for county-level sales tax, counties must develop local means for funding 911.

Regardless of which funding mechanism is used, many PSAPs still struggle to meet the high costs needed to provide adequate 911 services. Of the 139 PSAPs surveyed, 134 PSAPs (96 percent) responded to questions regarding their revenue sources. Of the 134 PSAPs reporting, only 45 PSAPs (34 percent) relied on only one source of revenue. The remaining 90 PSAPs (67 percent) relied on additional funding at the local level.

PSAPs that rely on a landline surcharge have seen funding decrease at a rapid rate. In addition to diminishing funds, landline surcharges place a disproportionate economic burden on the small percentage of the population still using the devices. Of the 139 reporting PSAPs, 38 PSAPs rely on a landline surcharge for sources of funding. Only eight PSAPs use surcharge funds exclusively, with the remaining 30 relying on additional funding at the local level. Inadequate funding from landlines has pushed many counties to adopt a county-level sales tax to fund 911. Since 2010, 10 Missouri counties have successfully passed measures to fund 911 from a general county sales tax.

Counties not utilizing the wireline surcharge or county-level sales tax are left without funding for 911 or must develop an alternative local mechanism. Of the 139 reporting PSAPs, 12 do not have a funding mechanism in place, thereby relying solely on local funding from 911.

In addition to being the only state without wireless funding, Missouri is also one of nine states that does not collect 911 funding from fees associated with pre-paid phones. Major phone operators (AT&T, T-Mobile, Verizon, Sprint, and Tracfone), have consistently seen increases in prepaid customers over the last 10 quarters, with 76.7 million prepaid customers by the last quarter in 2016.¹² Overall, this adds to an even higher number of Missourians who are benefitting from 911 services without contributing critical funds to support them.

6. PSAP CAPACITY

A PSAP's ability to handle and respond to incoming call volume is determined by its capacity. Due to a disjointed system marked by incompatible technology and a lack of interoperability among PSAPs, a single PSAP is typically independently responsible for handling all incoming call volume for its service area. In other words, a PSAP's capacity is determined by number of staffed workstations (including 911 answering equipment) at any given time, with no system to route calls to another PSAP if no call-taker is available. This point is especially important when discussing surge capacity, a PSAP's ability to handle a sudden or unexpected increase in call volume. Though surge capacity is typically marked as a PSAP's ability to handle large-scale emergencies or natural disasters, which should not be overlooked, even a minor incident could compromise a small PSAP's ability to answer 911 calls. For example, many PSAPs have only a single call-taking station and call-taker at any one time. Even everyday occurrences, such as a minor car accident, could result in more than one call to 911 and overload the system. This poses obvious concerns for citizens in emergency situations.

PSAP consolidation, as described in the next section, is one way to address inefficiencies for a PSAP's capacity.

7. CONSOLIDATION

Consolidation of PSAPs is a primary recommendation for improving 911 efficiencies and interoperability. The basis for consolidation is combining of PSAP services into a single entity, either physically or virtually through shared services. Although 911 consolidation historically centered on the

¹² Prepaid Phone News. "Fourth Quarter 2016 Prepaid Mobile Subscriber by Operator." February 14, 2017.

physical consolidation of public safety answering points into a single physical entity, updates to technology have allowed for consolidation to occur virtually through shared technologies.

There has been a shift in discussing 911 consolidation by categorizing consolidation models into “Pre-NG911 Consolidation Models” and “NG911 Consolidation Models.”¹³ Pre-NG911 Consolidation Models include consolidation of PSAPs functioning on a legacy 911 network, or one that cannot process IP-based calls.¹⁴ These consolidation types place a greater emphasis on physical consolidation and shared analog technology. In recent years, statewide IP capabilities have shifted the conversation to virtual consolidation through a statewide 911 network. This network, called ESInet, is discussed at length in the recommendations section of this report.

PSAP consolidation is an industry accepted standard for improving 911 services and efficiencies, backed by a vast body of research. Primary reasons for considering consolidation include service level improvements and the potential for cost-savings. The potential for improved services and cost-savings may vary based on the consolidation model used. Although consolidation comes highly recommended, there are several challenges that are barriers to 911 consolidations. The following sections further explore consolidation considerations, including: potential benefits, challenges, and different consolidation models.

7.1 REASONS TO CONSIDER CONSOLIDATION

- **Service Level Improvements:** Service level improvements are the most important reason to consider consolidation. The most common service level improvements result from greater efficiencies including: quicker call processing and dispatch times through the reduction or elimination of call transfers, improved interoperability among telecommunicators and first responders, and more consistent and standardized training and emergency response processes.
- **Potential Cost-Savings:** The potential for cost savings are another commonly cited reason to consider PSAP consolidation. Although cost-savings is certainly possible, it is important to recognize that not all consolidations result in cost-savings. Contrary to popular belief, most consolidations do not result in a reduction in personnel and personnel costs. The primary potential for cost-savings results from the sharing of expensive 911 equipment and technologies, including 911 trunking equipment, software, and dispatch systems.

7.2 CONSOLIDATION CHALLENGES

Although highly recommended for improving services and efficiencies, challenges associated with consolidation should be considered.

¹³ “Report for a 911 Consolidation Study Prepared for the State of Iowa” Kimball. December 2016

¹⁴ https://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-ADM-000.21-2017_Final_2.pdf

- **Political Challenges:** First and foremost are political challenges to consolidation. This primarily includes local control and awareness of a PSAP's 911-service area. Additional political barriers would need to be considered in terms of oversight, with consolidated PSAPs operating under multiple jurisdictions and government entities.
- **Concerns for Local Personnel:** Consolidation could also provide concerns for local personnel. As determined by the PSAP survey responses, a majority of call-takers perform additional duties outside of answering 911 calls. The consolidation of call-taking could be beneficial in certain instances by allowing personnel, many of whom are law enforcement officials, the benefit of time dedicated to provide other services.
- **Cost to Consolidate:** Although consolidation could result in cost-savings through shared technology, upfront costs to consolidate can be a barrier. PSAPs may need to abandon technology and infrastructure in which they have previously invested. When considering this challenge, it is important to recognize that most PSAPs are found within existing physical government buildings that include other public safety entities, thereby limiting costs associated with abandoning a physical space. Additionally, it is important to consider how quickly analog 911 technologies become obsolete. Therefore rather than investing in outdated technology, funds would instead be diverted to more up-to-date and longer lasting technologies.
- **Lack of Incentive:** Finally, counties in Missouri that have approved the 911 sales tax under RSMo 190.335 may feel little incentive to consolidate. In these instances, counties have taken it upon themselves to improve and secure their own sources of 911 funding. Often, these funds have already been used to make build or improve local PSAPs. In terms of consolidation efforts, PSAPs in sales tax counties would need incentives for cost-savings and improved services to justify consolidation.

7.3 CONSOLIDATION MODELS

There are several primary models of consolidation cited in the 911 industry, each of which has benefits and drawbacks. The ultimate recommendation for Missouri consolidation is a hybrid of these models, centered on virtual consolidation through the implementation of a statewide 911 IP network, regional coordination of 911 communications, and physical consolidation of some existing PSAPs. Primary consolidation models include:

- **Full Consolidation through a Single Statewide PSAP:** Full consolidation would assume a single call-taking center for the entire state of Missouri, sharing both physical space and technology. Benefits of this model would include: consistency in call-taking training and services statewide; and cost-savings from the elimination of redundant technology.

Although having the potential for efficiencies, there are barriers to this model's feasibility in Missouri. Primary barriers would be those associated with political challenges, concern for local personnel, and costs for consolidation. In 2017, the Missouri Chapter of NENA wrote a memo evaluating the feasibility of full consolidation in Missouri through a single statewide PSAP. The

memo assumed call-taking would take place in a single entity, with calls routed to local agencies for dispatch. The memo cited an exponential cost to the full consolidation model. A single statewide PSAP would require building or renovating a physical space large enough to accommodate the equipment and personnel necessary to handle all of the state's incoming 911 calls. This would include startup technology costs associated with equipping this building with 911 call-taking equipment. Additionally, there would be workforce challenges associated with filling the number of call-taking positions necessary to handle all 911 calls for the state within a small geographical area. Assuming that not all trained telecommunicators would be able to relocate, there would be high costs associated with training new telecommunicators, as well as concern for loss of local 911 personnel.

- **Partial Physical Consolidation:** Partial physical consolidation can occur through co-location or partial consolidation models.
 - **Co-location** allows separate 911 governing bodies to function independently, but share physical space and/or equipment. Benefits of this model include cost-savings associated with the sharing of physical space and technology, while allowing entities to maintain control of their own operations.
 - **Partial consolidation** combines emergency communication for multiple agencies within a specific geographical area, but not all agencies. For example, police and fire may combine their agencies, but EMS would handle its own communications. The host agency in which other entities would consolidate would control response services. This could result in efficiencies associated with operating under a consolidated governing structure, but would still require that PSAPs are capable of transferring calls to other agency PSAPs.
- **Full Physical Consolidation:** Under a full physical consolidation, multiple PSAPs from adjoining jurisdictions combine PSAP operations into a single physical entity. This could include instances when an existing PSAP takes over operations for an area that lacks adequate 911 services.
- **Shared Technology or Virtual Consolidation:** Virtual consolidation through shared services allows PSAPs to share technology and systems, without having to share physical space. Virtual consolidation of legacy systems typically occurs at a local, or sometimes regional level. Participating agencies enter agreements to jointly procure or share 911 answering equipment, software, CAD systems, and radio consoles to connect them through analog remote configuration. Modern NG911 technology allows for the potential of virtual consolidation through shared technology and through a shared IP network. Through virtual consolidation, local agencies can maintain their physical PSAP and personnel, while still benefitting from the cost savings, and improved interoperability and efficiencies from shared technology.

8. RECOMMENDATIONS

The following section proposes recommendations to meet statutory requirements for delivering the best possible 911 technology and service to all areas of the state in the most efficient and economical manner possible. Recommendations were informed using studies and recommendations for other states, and made unique for Missouri using data from the statewide PSAP survey and with consideration for the Missouri's 911 environment. Primary recommendations include implementation of a statewide 911 IP network and regional PSAP coordination as well as the funding, statute, and DPS personnel necessary to support and implement recommendations.

Individual recommendations are discussed in detail and include:

- Develop and Implement a Statewide 911 Network
- Regional 911 Coordination
- Consolidate Existing PSAPs
- Funding
- Statutory Change

8.1 DEVELOP AND IMPLEMENT A STATEWIDE 911 NETWORK

The foremost recommendation to deliver the best technology and 911 service to all Missourians in the most efficient and overwhelmingly cost-effective way would be to develop an **Emergency Services IP Network (ESInet)**. The development of such a system would simultaneously create interoperability among PSAPs, radically improve statewide 911 services and emergency response, and generate significant cost-savings to individual counties. An ESInet, “is a managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core services can be deployed, including, but not restricted to, those necessary for providing NG911 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks). The term ESInet designates the network, not the services that ride on the network.”¹⁵

Essentially, a statewide ESInet would serve as the backbone of the 911 network, connecting PSAPs and allowing for a seamless transfer of data received from 911 calls. As previously described, Missouri PSAPs currently depend on individual analog 911 systems and disjointed technology that is rapidly becoming obsolete. A statewide ESInet would require two data centers that house shared technology, including routers capable of handling all 911 calls generated to the state. One data center would remain active, with the second serving as a backup system with redundant technology. Once a 911 call is placed anywhere in the state, call information would be delivered to the ESInet and seamlessly routed to the appropriate PSAP for call taking and processing. In order to plug into this network, an individual PSAP

¹⁵ National Emergency Number Association. “ESInet (Emergency Services IP Network).” June 28, 2017. [https://nenawidi.org/wiki/ESInet_\(Emergency_Services_IP_Network\)](https://nenawidi.org/wiki/ESInet_(Emergency_Services_IP_Network))

would need broadband connection to the data center, and a computer with the software necessary to receive data delivered by the ESInet. The ESInet itself would take the place of a PSAP's costly backroom server equipment. Moving to an IP enabled framework would create an actual 911 system of PSAPs with redundant capabilities and increased levels of service at the greatest level of cost-savings.

The service level improvements enabled by this system would be dramatic for the state as a whole. First and foremost, it would allow all PSAPs to be seamlessly connected through an IP network provided by shared technology. An ESInet's ability to instantaneously shift 911 calls from one PSAP to another is vital for a number of reasons. First, it serves as an automatic backup if one PSAP goes offline, allowing calls to be routed to another PSAP for call taking and processing. Additionally, under the current system, a number of Missouri PSAPs may be overwhelmed by any influx in call volume, resulting in wait times for citizens in emergency situations. With an ESInet, a call that otherwise might be put on hold would instead be routed to another available PSAP. This would prove especially important in instances where surge capacity is needed to respond to large-scale emergency situations, or provide redundancy and resiliency in cases of a natural disaster. Finally, the interoperability among PSAPs would allow for pertinent information to be received at the appropriate PSAP that may otherwise be extremely difficult to communicate. For example, a citizen in one region of the state may identify a friend or family member on the other side of the state in need of 911 services. With interoperability provided by the ESInet, that citizen could call 911 and be routed to their family member's local PSAP to deliver information.

Additionally, the data received at an individual PSAP would allow for the highest 911 service level possible. With appropriate technology, a PSAP connected to the statewide ESInet would instantly move to the highest 911 service level possible, allowing call-takers to receive texts, videos, pictures, and other multimedia communications. This means that counties currently receiving only basic 911, with no caller information received at a PSAP, would now be equipped with the infrastructure needed to receive data from commonly used mobile devices and emerging communication trends. Citizens in need of emergency assistance could stream video of emergency incidents, and send photos of accident damage, criminal suspects, or transmit medical information, all of which could be critical for 911 call takers to respond to the incident quickly and efficiently.

In addition to drastically improved service levels, a statewide ESInet system would also result in significant cost-savings for counties. Currently, a majority of Missouri PSAPs pay for and maintain their own 911 trunks, or communication paths between central office switches or between the 911 control office and PSAP. With the exception of personnel costs, this is typically the most costly budget item for a PSAP. Once an ESInet is implemented, a PSAP would instead connect to the ESInet system which would serve as the PSAP's 911 trunk. The individual PSAP would enter into an agreement for shared services and the cost for this technology would be shared among all PSAPs in the network. At its physical location, a PSAP would need the bandwidth connection to the ESInet through a secured workstation equipped with the software needed to receive Next Generation 911 data. The equipment used or provided at workstations would need to meet provider standards to ensure secure data transfer.

The approximate cost for all equipment needed would cost a PSAP approximately \$25,000 per call-taking position.

8.2 REGIONAL 911 COORDINATION

8.2.1 DESIGNATE REGIONAL 911 COORDINATION CENTERS

The next recommendation for efficient and economical 911 services to Missourians would be designation of **Regional 911 Coordination Centers**. Regional 911 Coordination Centers would be designated by the 911 Service Board and based on certain criteria. In order to be cost efficient, it is recommended that no new PSAP be built.

8.2.2 CRITERIA FOR REGIONAL 911 COORDINATION CENTERS:

In order to deliver the best possible 911 technologies and service in the most efficient manner possible, the coordination center should be required to meet a number of criteria. In order to be considered for designation as the Regional 911 Coordination Center, a PSAP would prove its ability to do the following:

- **Connect to a Statewide ESInet:** In order to increase statewide efficiencies and interoperability, it is critical that all regional coordination centers are connected to a statewide ESInet. A regional coordination center must have the ability to transfer calls to every other regional coordination center in the state, as well as any local PSAPs connected to the ESInet.
- **Equipped and staffed to handle call influxes:** 911 coordination centers need to be equipped with the number of physical workstations and staffed with sufficient personnel necessary to handle any influx in call volume for the region.
- **Provide Emergency Medical Dispatch:** Every regional 911 coordination center should provide, or arrange for provision by a secondary PSAP, for all emergency medical calls to be answered by a telecommunicator trained and certified in EMD. Training and certification of EMD for telecommunicators should be consistent with standards set by the International Academies of Emergency Dispatch (IAED).

8.2.3 RESPONSIBILITIES OF REGIONAL 911 COORDINATION CENTERS:

- **Coordinate Access to ESInet and NG911:** Regional coordination centers would coordinate statewide interoperability among all PSAPs within their region through the use of a statewide 911 Emergency Services Network (ESInet). Under the direction of the 911 Service Board, a regional coordination center would coordinate access to high quality and cost effective Next Generation 911 service throughout the region through the ESInet.

- **Coordinate regional interoperability and consolidation efforts:** Regional coordination centers would assist with enhancement and interoperability efforts within the region by providing recommendations, guidance, and oversight to PSAPs. With knowledge of the region, coordination centers would be better equipped to assist in coordination efforts among PSAPs in their region. This includes an understanding of the geography, political subdivisions, and existing systems that need to be considered for effective consolidation.
- **Implement Training Standards:** Regional coordination centers would work to standardize academic training for 911 telecommunicators within the region as required under RSMO 650.340 911 Training and Standards Act.
- **Implement Emergency Medical Dispatch (EMD) Standards:** Regional coordination centers would provide guidance to telecommunicators receiving requests for emergency medical dispatch assistance. Guidance would be based on national certification standards for EMD.

8.3 CONSOLIDATE EXISTING PSAPS

Every PSAP should evaluate the potential efficiencies and cost savings created by sharing services with other PSAPs in the region and/or with a regional 911 coordination center. Consolidation of PSAPs is one method of creating efficiencies that could be considered, if that action creates financial and operational efficiencies for the PSAPs involved. PSAPs that are already providing the best possible technology and service to their population in the most efficient and economical manner possible should continue that function. Virtual consolidation, or shared technical services between PSAPs or the regional 911 coordination center should also be pursued to meet the interoperability goals of the state and decrease redundancy.

Current Missouri PSAPs should be prioritized for consolidation if they do not meet minimum acceptable service quality, have inadequate infrastructure for handling call volumes, or are relying on insufficient sources of funding. Based on minimum standards for providing adequate 911 services at a reasonable cost to citizens, PSAPs should be prioritized for consolidation if they do not meet the following criteria:

- **The PSAP does not provide at least Phase II level service.** Phase II level service is the minimum service level standard expected by the 911 industry and general population. At this service level, a PSAP is able to locate a caller calling from wireless devices.
- **The PSAP has less than three physical workstations.** With fewer than three physical workstations and call-taking positions, an individual PSAP is not equipped to handle any influx in call volumes.
- **The PSAP does not provide adequate 24/7 services.** Without two 24/7 staffed positions to provide 911 emergency response service, a PSAP is not capable of providing adequate fulltime service.
- **The PSAP is not capable of connecting a caller to EMD pre-arrival and post-dispatch instructions.** PSAPs providing EMS dispatch should be capable of providing EMD pre-arrival

and post-dispatch instructions. If the PSAP does not provide EMS dispatching services, it should be capable of transferring a caller to another PSAP capable of providing EMD pre-arrival and post-dispatch instructions.

- **The PSAP is not compliant with the 911 Training and Standards Act.** Missouri Statutes 650.340 and subsequent rules provided by the Department of Public Safety outline the training standards and continuing education necessary for a telecommunicator. Quality emergency response is contingent upon this training.
- **The PSAP does not have a sufficient funding source to support current operations.** 911 services should not be compromised by inadequate funding.

8.4 FUNDING

In order to provide the best possible 911 technology and service to all areas of the state in the most efficient and economical manner possible, additional funding must be made available at both the state and local level.

- **ESInet Funding:** Funding must be secured at the state level to develop and deploy a statewide ESInet necessary to drastically improve interoperability and services and lower costs to the county. Additional state funding would be necessary to assist with the operation of regional 911 coordination centers. Startup funds for the statewide ESInet could be provided through state appropriations, or through state bonds.
- **Local Wireless Funding:** Counties should be given the authority to adopt a 911 fee on any device capable of contacting 911. Missouri remains the only state without any funding from wireless devices, leaving counties without the means necessary to adopt consistent and adequate sources of funding. Even when counties manage to sustain local PSAPs, they may lack the capital needed to keep up with technology and upgrades to respond to evolving technology.
- **Prepaid:** Missouri should consider including a 911 fee on prepaid phone devices to be collected at the point of sale. Forty-one other states collect 911 fees from prepaid devices, which are becoming an increasingly large segment of the market.

8.5 STATUTORY CHANGES

In addition to statutory authority for additional funding opportunities, other statutory change is necessary to ensure efficient state 911 operations.

- **Moratorium on the Creation of New PSAPs:** With approximately 185 PSAPs currently, no additional taxpayer money should go to the creation of a new physical PSAP in Missouri. Shared services through a 911 network and physical consolidation have proven to result in improved services and cost savings. In an effort to further move toward the improved service levels and cost-savings associated with the 911 network, legislation should be approved requiring that usage of

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all current and future PSAP funding (RSMo 190.305 and 190.335) should be restricted to expenditures congruent with the state consolidation plan.

- **Remove Legal Barriers to Consolidation:** Current Missouri law is inefficient in promoting consolidation between governmental jurisdictions.
- **Additional DPS Staffing:** The Department of Public Safety should be provided sufficient funding for staffing or contracting of services to implement the recommendations of this report.

This report was presented to and endorsed by the 911 Service Board on February 22, 2018. Members:

- Acting Chair Mike Dierkes,
- Chief Mark Hasheider,
- Sheriff Rodney Herring,
- Sheriff Stephen Korte,
- Chief James Person
- Elizabeth Pierson,
- Sonny Saxton
- Lisa Schlottach, and
- Alan Wells.